

WHAT IS CLAIMED IS:

1. A heat treatment apparatus for heating a substrate by irradiating a flashlight thereto, comprising:

- 5 a light source having a flash lamp;
a chamber provided under said light source;
a susceptor for holding a substrate in a substantially horizontal position in said chamber;
a lifting mechanism for lifting up said substrate held by said susceptor from an
10 upper surface of said susceptor; and
a lift control element for controlling said lifting mechanism to operate said lifting mechanism before irradiation of a flashlight from said light source to lift up said substrate held by said susceptor as well as to stop the operation of said lifting mechanism at irradiation of a flashlight from said light source to cause a gas layer to be sandwiched
15 between said upper surface of said susceptor and said substrate for bringing said substrate into a floating state.

2. The heat treatment apparatus according to claim 1, wherein said lifting mechanism includes:

- 20 support pins insertable into said susceptor and capable of mounting thereon a substrate with top ends thereof extending out of said upper surface of said susceptor; and
an elevating mechanism for moving said support pins upwardly/downwardly relatively to said susceptor between a position where said top ends of said support pins are located under said upper surface of said susceptor and a position where said top ends
25 of said support pins extend out of said upper surface of said susceptor to support said

substrate held by said susceptor, wherein

said lift control element controls said elevating mechanism to cause said support pins to extend out of said upper surface of said susceptor before irradiation of a flashlight from said light source to lift up said substrate held by said susceptor from said upper surface of said susceptor as well as to move said support pins downwardly to a position under said upper surface of said susceptor at irradiation of a flashlight from said light source to cause a gas layer to be sandwiched between said upper surface of said susceptor and said substrate for bringing said substrate into a floating state.

10 3. The heat treatment apparatus according to claim 1, wherein

said lifting mechanism includes a gas discharging mechanism for discharging gas from said upper surface of said susceptor toward a lower surface of said substrate held by said susceptor, and

said lift control element controls said gas discharging mechanism to cause said gas discharge mechanism to discharge gas toward said lower surface of said substrate held by said susceptor before irradiation of a flashlight from said light source to cause said substrate held by said susceptor to be lifted over said upper surface of said susceptor as well as to cause said gas discharge mechanism to stop discharging gas at irradiation of a flashlight from said light source to cause a gas layer to be sandwiched between said upper surface of said susceptor and said substrate for bringing said substrate into a floating state.

25 4. The heat treatment apparatus according to claim 1, further comprising a preheating mechanism for preheating said substrate held by said susceptor before irradiation of a flashlight from said light source, wherein

said lift control element operates said lifting mechanism after the temperature of said substrate held by said susceptor reaches a predetermined preheated temperature.

5 5. A heat treatment method of heating a substrate by irradiating a flashlight thereto, comprising the steps of:

- a) holding a substrate on a susceptor in a substantially horizontal position;
- b) operating a lifting mechanism to lift up said substrate held by said susceptor from an upper surface of said susceptor;
- c) causing said lifting mechanism to stop operating to cause a gas layer to be
10 sandwiched between said upper surface of said susceptor and said substrate for bringing said substrate into a floating state; and
- d) causing a flash lamp to irradiate a flashlight toward said substrate being in a floating state.

15 6. The heat treatment method according to claim 5, wherein
 said step b) includes the step of causing support pins insertable into said susceptor to extend out of said upper surface of said susceptor to lift up said substrate held by said susceptor from said upper surface of said susceptor, and

 said step c) includes the step of moving said support pins downwardly to a
20 position under said upper surface of said susceptor to cause a gas layer to be sandwiched between said upper surface of said susceptor and said substrate for bringing said substrate into a floating state.

 7. The heat treatment method according to claim 5, wherein
25 said step b) includes the step of discharging gas from said upper surface of said

susceptor toward a lower surface of said substrate held by said susceptor to lift up said substrate held by said susceptor, and

said step c) includes the step of stopping discharge of said gas to cause a gas layer to be sandwiched between said upper surface of said susceptor and said substrate
5 for bringing said substrate into a floating state.

8. The heat treatment method according to claim 5, further comprising the step of

e) preheating said substrate held by said susceptor before irradiation of a
10 flashlight from said light source, wherein

said step b) is executed after the temperature of said substrate held by said susceptor reaches a predetermined preheated temperature.

9. A heat treatment method of heating a substrate by irradiating a flashlight
15 thereto, comprising the steps of:

a) holding a substrate over a susceptor in a substantially horizontal position;

b) moving said susceptor and said substrate upwardly/downwardly relatively to each other to mount said substrate on an upper surface of said susceptor; and

c) causing a flash lamp to irradiate a flashlight toward said substrate while said
20 substrate is floating with a gas layer sandwiched between said upper surface of said susceptor and said substrate after said substrate is mounted on said upper surface of said susceptor.

10. The heating method according to claim 9, wherein
25 said flash lamp irradiates a flashlight toward said substrate within seventy

seconds after said substrate is mounted on said upper surface of said susceptor.

11. A heat treatment apparatus for heating a substrate by irradiating a flashlight thereto, comprising:

5 a light source having a flash lamp;
 a chamber provided under said light source;
 a susceptor for holding a substrate in a substantially horizontal position in said chamber;

 support pins insertable into said susceptor and capable of mounting thereon
10 said substrate with top ends thereof extending out of an upper surface of said susceptor;

 an elevating mechanism for moving said support pins upwardly/downwardly relatively to said susceptor between a position where top ends of said support pins are located under said upper surface of said susceptor and a position where said top ends of said support pins extend out of said upper surface of said susceptor to support said
15 substrate held by said susceptor; and

 an irradiation control element for controlling said light source to cause said flash lamp to irradiate a flashlight toward said substrate while said substrate is floating with a gas layer sandwiched between said upper surface of said susceptor and said substrate after said elevating mechanism moves said susceptor and said substrate
20 mounted on said support pins upwardly/downwardly relatively to each other to mount said substrate on said upper surface of said susceptor.

12. The heat treatment apparatus according to claim 11, wherein

 said irradiation control element controls said light source to cause said flash
25 lamp to irradiate a flashlight toward said substrate within seventy seconds after said

substrate is mounted on said upper surface of said susceptor.